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SINTA 2

Social Economy and Digital Mapping of Subak Sembung Ecotourism

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ABSTRACT

The social, cultural, economic, and environmental potentials in Subak Sembung are not well-developed, such that these potentials have not been adequately explored by the local community. This study aimed to describe the synergy between subak and the ecotourism in supporting the sustainable national food stability program. Subak Sembung selected as the study location because its location in the middle of Denpasar City and already developed as ecotourism sites. There were 66 participants involved in this study. Formal surveys, rapid appraisal, and map-making through satellite imaging from the Google Earth Pro (GE) application were used to collect the data. Result revealed that the social economy social activities conducted by the farmer were: (1) seed-producing tools, fertilizers, pesticides, agricultural tools, (2) land-tillage, nurseries, cultivating, preserving the plant, harvesting, (3) marketing, and (4) the correlation between farmers, subak and ecotourism; worth to be developed as a tourist attraction site.

Keywords: Mapping, Subak, Farmer acitivies, Tourism

INTRODUCTION

Recently, the tourism sector in Bali is rapidly developing. Despite its positive impact on the economic aspect, it also caused extreme agricultural land conversion to settlements or tourism supporting facilities in Denpasar city. On the other hand, those land conversions also contributed to the massive decrease of the rice paddy field and finally threaten the existence of the subak (Bali's traditional water control system in rice paddy field). To respond to this issue, the Bali government transformed the rice paddy field area in Bali as a tourism object which based on the ecotourism principles, expected to maintain the *subak* existence in Denpasar City. Mondino and Beery (2018), stated that conservation dichotomy versus sustainable development triggerred controversies among the researchers and stakeholders. The appearance of ecotourism as one of the tourisms that focus on the nature, undoubtedly supported the local community income and provided specific spots to learn to love nature. Although ecotourism aimed to strengthen the connection between conservation and sustainable development, this type of tourism also potentially faces a bunch of challenges in the future. In accordance with this statement, Tanaya and Rudiarto (2014), stated that community-based ecotourism is an effort performed to develop a village through the tourism sectors that not only serving us with the natural tourism site, but it also majorly contributed to the environmental conservation.

A study conducted by Hijriati and Mardiana (2014), revealed that the development of community-based-eco-tourism in Batusuhunan Village contributed positive impacts to the community especially on the ecology, social, and economic aspects. In line with this result, Salakory (2016), added that the development of ecotourism with community-based in

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Banda Islands required a guarantee and ensure the sustainable development of the community-based-ecotourism. The result of this study found that the development of community-based-ecotourism in Banda performed based on the sustainable concept by forming an organization consisted of expertise in ecotourism and community member who actively involved in ecotourism, to maintain a sustainable development in its economic, social, and environmental aspects.

Nowadays, a direct or non-direct challenge faced by *subak* in Bali, stemmed from various sources, one of them is from the tourism sectors. The extreme agricultural land conversion to tourism facilities threatened the *subak* existence as a traditional and cultural irrigation system in Bali. Without the rice paddy field, *subak* is impossible to be conserved. This traditional Balinese culture is approaching its extinction as the consequence of the failure conservation. Therefore, appropriate works from various sectors were required to conserve the rice paddy field in Bali and its irrigation system (Sutawan, 2001).

An effort that can be performed to conserve subak and build a sustainable agricultural development is through modifying the rice paddy field as a tourism object based on ecotourism principles. Ecotourism should be reduced the negative impact on the environment and local culture, also able to improve the local community income and the conservation values.

Subak Sembung is a rice paddy field in Kota Denpasar that runs by using ecotourism principles. Subak Sembung still could manage to survive in the middle of Denpasar City. Besides that, the Subak Sembung area still has a large land that can develop into an ecotourism area. Subak Sembung is also already well managed physically. The local community built a concrete road along the 1 km rice paddy field sides with 2 meters width. They also constructed some traditional Balinese huts in this concrete road. The tourist could be enjoying the rice paddy field view while relaxing in these huts. The Subak Sembung ecotourism is considered as an effort to conserve the environment, preventing agricultural conversion, saving the rice paddy field, preventing flood, and green areas that are maintained well in Denpasar City.

The social, cultural, economic, and environmental potencies in Subak Sembung was not well-elaborated that caused these potentials did not adequately explore by the local community. Their land control system, farmer idealism to use their land only for agricultural purpose, production factors that did not engage properly, the natural beauty, agrarian culture, and the subak's enchantment have not investigate scientifically. Based on those issues, we conducted a social economy and digital mapping in Subak Sembung. This study aimed to describe the synergy between the subak and ecotourism in supporting the national food stability programs that divided into two specific aims: 1) mapping the social economy activity of the farmer in Subak Sembung and 2) digitally map the Subak Sembung area.

METHODOLOGY

Subak Sembung is selected as the study location because it was still actively employed tourism activities in the middle of Denpasar City. Subak Sembung also had an area that potentially developed as an ecotourism site. Subak Sembung had a width of 115 ha that was classified administratively into Peguyangan, North Denpasar District area. The study population was 192 rice paddy farmers who was a member of the farmer association of Subak Sembung. Sugiyono (2015), stated that if the number of population is known, the number of participants in a study was calculated by using the Slovin formula. There were 66 farmers participated in this study.

Data were collected using observation, survey, and interview method. An interview defines as a two-way communication conducted by the researcher to the participant to obtain information needed by

studies. The interview questionnaire given to the farmer and the list of questions given to the key informant. Digitally mapping is done by field observations to make the identification process easier. The coordinate of the agricultural business in Subak Sembung tracked by using GPS as the attribute component of the SGI mapping.

The study's aim was describing: (1) seed-producing tools, fertilizers, pesticides, agricultural tools (2) land management, nurseries, cultivating, plant preserving, harvesting, (3) marketing, and (4) linking farmers, subak, and ecotourism. Those items assessed, analyzed by the formal survey and rapid appraisal (Suharto, 1997). Rapid appraisal method employed in this study. This method used to collect the data about the perception and suggestions from the targeted population and other stakeholders regarding the community's social economy rapidly. This method consisted of: (1) key-informant interview; (2) direct observation; (3) secondary data tillage; and (4) mini-survey.

This study aimed to map the Subak Sembung area digitally. This mapping began by taking satellite imaging for the study location from the Google Earth Pro (GE) application. Many studies reported that this app had used for remote sensing. Hu *et al*. (2013) reported that the GE accuracy was 78.7% for classifying the land cover in Wuhan City. This percentage was lower but didn't significantly different from the Quick Bird imaging.

A study done by Wang *et al.* (2017) ,and Wei *et al.* (2018), also employed GE imaging to collect data about road and its design with certain improvisation to improve the elevation precision. A similar study also conducted by Vougat *et al*. (2019), in Maroua-Kamerun, found that the accuracy of the object imaging until the level of imaging a house was 72%. GE app was found to be more efficient in terms of the resource and cost needed in comparison with the Global Positioning System (GPS). Despite this result, Hu *et al*. (2013), recommended using GE imaging to map the land or land cover, there were some weaknesses in using this app, one of them is the size of the object identified is too small. Hence, we combined this app by surveying to obtain detail and specific utilization of the Subak Sembung area.

A survey in Subak Sembung was conducted to collect specific coordinates and a detailed overview of the study location. The coordinate point is taken by using GPS in some activities such as: area border, plant commodity representation in an area of the Subak Sembung, jogging track, irrigation route, and subak facility. The GE imaging data the imported to the Arcmap application to ensure the coordinate data synchronicity with the satellite imaging (georeferencing). This was done to create a map that provides exact coordinates of a location. Finally, the digitalization conducted on the survey result to the coordinate from the satellite imaging that is already corrected. Hence the map is ready to use.

RESULT AND DISCUSSION

Social Economy of Subak Sembung's Farmer

Seed-Producing Tool, Fertilizer, Pesticide, and Agricultural Tool

The procurement of seed is done by drafting the List of Subsidized Seed Suggestion (LSSS) according to the seed requirement. The drafting process aimed to decrease the cost needed and obtained subsidized from the Staple Food and Horticultural Department of Denpasar City. On the cultivation season from July - October, the type seed subsidized by the government was the ciherang variety. They also obtained free seed from the government: situ bagendit variety.

The procurement of the fertilizer for the agricultural practice in Subak Sembung done through drafting the Definitive Group Requirement Plan (DGRF) according to the type of fertilizer required. This DGRF functioned to obtained fertilizer aid (subsidy) from the Staple Food and Horticultural Department of Denpasar City. In the cultivation season in July-October,

the type of fertilizer subsidized by the government was urea fertilizer. The farmer combined this fertilizer with NPK phonska in running their agricultural practice.

The most common herbicides used were DMA and ally plus, while the pesticides were confidor and fastac. The herbicides are employed to control the growth of weed in the rice field area, and the pesticide is to eradicate pests that attack the rice paddy plant.

The agricultural tools employed by the farmer in Subak Sembung are general tools used for agricultural activity. Those tools were sprayers, hoes, sickles, and drained machine. The majority of the farmer did not buy different agricultural tools for each cultivation season. If it is well maintained, those tools could be used for several cultivation seasons.

Mohamed *et al.* (2016), stated that sustainable agriculture is closely related to the agricultural practices: land preparation, fertilizer utilization, and weed management. The weed and pest management practice majorly contributed to the failure of the sustainable agriculture. Parallel with this statement, Terano *et al.* (2015), also found that improving farmer awareness about the sustainable agricultural system was a main challenge faced by agriculture educators in Malaysia. They also found that educational program through education and training is urgently required.

Rope *et al.* (2019), stated that the natural agricultural system is a world tradition of agriculture that slowly disappeared due to the effect of globalization, but Kepulauan Morotai Regency was able to maintain this culture and had already developed it with local geniuses. The productivity in the harvesting period was low, but they had some sustainable indicators on their agricultural tradition that found to be contributed significantly to maintain the food stability in the farmer-house level. In line with these findings, Roth (2011), elaborated a local genius in Indonesia recognized by the international world is Subak. Subak has a long history as a traditional irrigation system in Bali. This local genius was adopted by some areas in Indonesia because of the transmigration program. Furthermore, Laksmi *et al.* (2019), also explained that Subak as a tourism and cultural icon of Subak in Bali Province thick of traditional values: religiosity, social, and ecology. UNESCO also had declared subak as a world cultural heritage.

Land-Tillaging, Nurturing, Cultivating, Plant Preseving, Harvesting

Some activities conducted in Subak Sembung rice field were: removing the straw, cleaning the irrigation water channels, plowing, and balancing the soil. Generally, after the harvesting period, there were remnants of rice paddy from the previous cultivating season in the form of straw, so the initial stage in the land cultivation process is to remove it from the rice field. Besides, to remove the straw, farmers clean their water channels from garbage or weeds that are carried by the water.

Generally, the land-plowing was done twice, but some farmers could only done once. It happened due to the short amount of time provided to finish one session of land-plowing. The first step in land plowing was named as rough plowing that aimed to invert the soil, the remaining straw, and killing weed in the rice field. After the first plowing was done, the second plowing started to be done by the farmer. This plowing is known as fine plowing that aimed to soother the texture of the soil in the rice field.

The seeding process done in the same way as the other well-known seeding process. The seeding process usually done by the farmer as the owner of the land. The step of this process were as follows: (1) preparing the rice field for the seeding process, (2) preparing the seeding process in the ricefield, (3) soaking the seed in the water in 24 hours, (4) brooding the seed inside a sacks by folding the both tip of the sack, and (5) placing the seed in a shady place in 24 hours. After the seed growing, white speckle sprouts, the seed spread in the prepared rice field.

The majority of the farmer did not measure the cultivation distance between the seed during the nursery, they just estimated the proper distance between the seed. The pesticides are given in the 10-14 days after the nursery as the preservation effort. The preservation done by the farmer according to the seed condition. The pesticide only given if there was a pest attack on the field. The seed was ready to be moved to the field after 18-25 days since the first time spread on the nursery. Seed that too old would affect the number of sprout and duration of the harvesting.

The seed plantation ranged from 18-25 days old. The cultivation distance used by farmers in Subak Sembung was in a rectangular size of 25 cm x 25 cm or also known as a tile system. The number of seeds planted in each hole was 4-5 rice seeds. The depth of the planted seed was approximately 2-3 cm per hole.

The plant preservation activities were irrigation, weeding, fertilization, and management of plant pests. According to the interview with the farmers in Subak Sembung, the water depth needed when the rice paddy was 0-14 days after cultivating was 2-3 cm, while the water depth required of 14-30 days was up to 5-10 cm. When the rice paddy have started to form the grain, the water added up to 20 cm. After that, the water began to be reduced slowly. Around ten days before harvesting, the rice field would be drained by the farmer.

Sutjipta (2016), stated that Subak is thick of religious activities. Almost all activity in Subak involved religious activities, in the form of group or individual rituals. Balinese farmers strongly believed in the concept of land as the Mother Earth, water as the symbol of Lord Vishnu, Iswara as the wind, and rice as Dewi Sri. This strengthens the subak as the cultural wisdom with the spirit of Hinduism and Tri Hita Karana. A study conducted by Hastuti *et al.* (2017), in the Banjar Tribe of South Kalimantan Province revealed that the agricultural practices carried by the Bahuma farmers were thick with Islamic nuances. The rituals performed by Banjar tribal farmers were manaradak (seeding), batanam (cultivating), mangatam (harvesting), and imbahkatam (post-harvesting).

Marketing System

There was no processing activity done by the farmer in Subak Sembung in the harvesting period because they joined in a slasher system (*tebasan* in Bahasa Indonesia). Slash system is a marketing system done by involving a slasher to buy and market the commodity harvested by the farmer with 'estimation system'. The estimation system referred to a system where as the slasher estimating the commodity harvested into grain unit to IDR unit.

There were several profits and losses in the farmer party. The farmer did not require to do the rice harvesting and the marketing process, these steps were conducted by the slasher. Unfortunately, the farmer was not able to know the maximum number of rice paddy harvested in each harvesting season.

The marketing system began when the rice paddy reached its 80-90 days age. The slasher would check the rice paddy, surveying the rice commodity before decided to do transaction with the farmer. Nearly the harvesting period, many slashers would come to the rice field to bargain the price of the rice commodity. The calculation involved the estimation of the width of the rice field area and the condition of the harvested rice paddy.

The marketing system done by farmers in Subak Sembung stopped in the slasher party. The next activity continued by the slasher party. These systems showed that the farmer did not require to use their own cost for the grain transportation activity.

Fauzi *et al.* (2014), stated that impacts from the slash system to the socio-economic aspect of the farmer were: 1) reducing the risk and made the harvesting and marketing system easier, 2) reducing the chance to work around the farmer's house because the owner would employ their own worker, and 3) high chance of

fraud, especially in during the period of paying the commodity harvested. Puspita (2019), stated that the educational level, agricultural experiences, and the number of workers individually affected the sale of rice paddy with this system.

Hartono (2019), also stated that the slash system tends to use an 'estimating system' without paying more attention to the quality and quantity of rice paddy sold, which indicated that the weight of the rice paddy was only estimated but did not appropriately measure before sold to the distributor. This system commonly used by the local community and passed from generation to generation. Hence, the slash-and-burn system already unified and became a habit.

The Correlation Between Farmer, Subak, and Ecotourism

Establishing Subak Sembung as an ecotourism site brought a high sale value to this place as a tourism site. This ecotourism site added economic and environmental value to all parties involved in the management. To achieve the goals set, the management party actively involved all parties in Subak Sembung.

The party involved was the community in Peguyangan Village and farmers that cultivated their agricultural community in Subak Sembung. The active involvement required is creating a cooperation with them as the partner in developing Subak Sembung as an ecotourism site. To deliver the program that already packed in package properly, the management party involved the local community and the farmer around Subak Sembung area.

Subak Sembung provided three ecotourism packages: education, eating, cycling, and staycation. These packages involved farmers that cultivated agricultural commodity in the Subak Sembung area. In general, visitation from the foreign and local tourists indicated that Subak Sembung area considered as an ecotourism site. The most tourist also enjoyed the view offered in Subak Sembung.

Farmer is the object in land-tillage activity. In this correlation, the farmers were actively involved in demonstrating the process of land-tillage, especially in rice paddy cultivation. This demonstration was a part of the tourism-package offered in Subak Sembung. The type of land-tillage was demonstrated depended on the tourist request. There were two types of land tillage: (1) conventional and (2) modern by using tractor.

Another land-tillage activity in this package was rice paddy cultivation. In this activity, the farmers given the tourist chance to try the rice paddy cultivation. This activity was very beneficial for the tourist because they obtained new experience and knowledge by involving actively in the rice paddy cultivation. The farmer involved in the ecotourism activity after the management of the Subak Sembung ecotourism site obtained their consent.

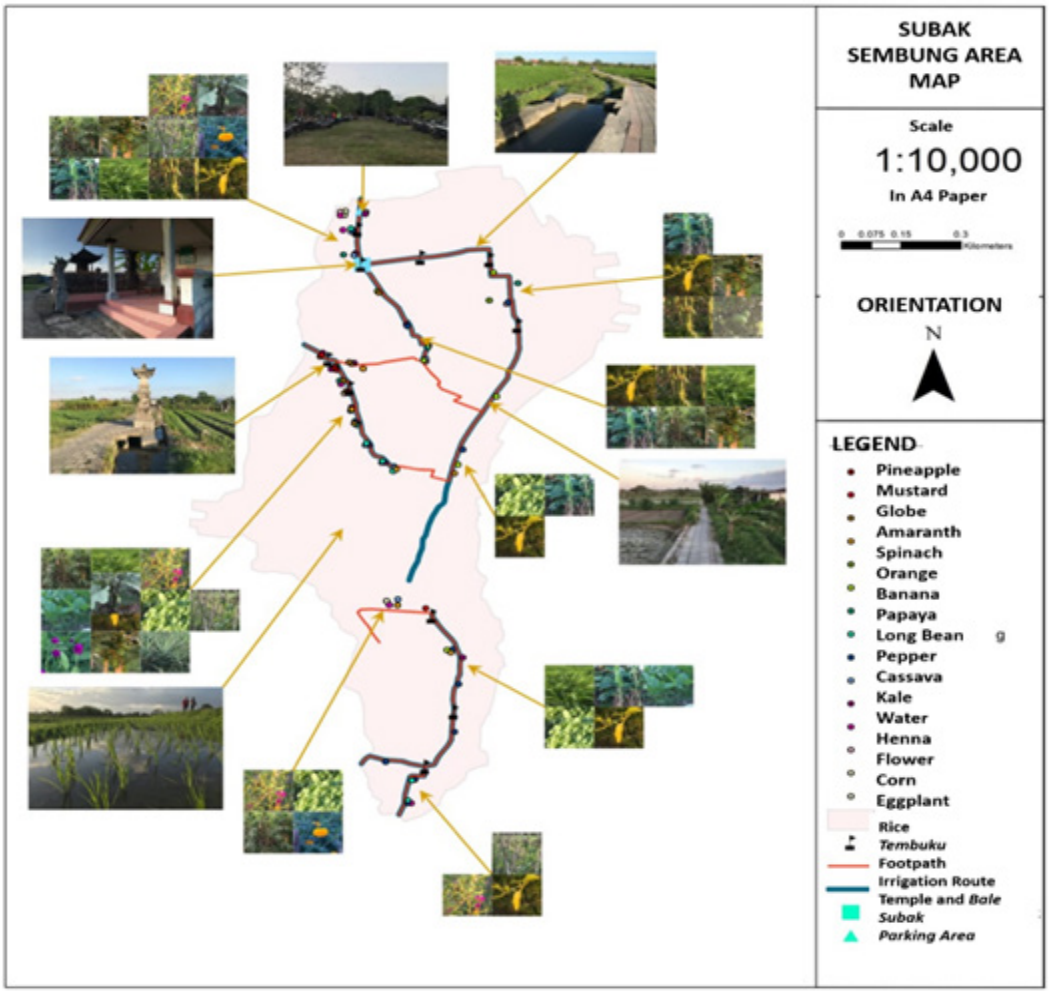
Snyman (2014), stated that ecotourism is an effort of sustainable land-use that will support the development of local social-economic development and biodiversity conservation. Furthermore, Das and Hussain (2016), stated that ecotourism is a conservation-based business that able to strengthen the economy in the level of home industry and improve the community behavior toward conservation. Situmorang and Mirzanti (2012), also stated that the development of ecotourism done based on local community empowerment through educational, social entrepreneurship, and cultural conservation programs. Social entrepreneurship majorly impacted the level of wellness and education.

Map of Subak Sembung Area

Ecotourism Subak Sembung has an area of 103 ha (Figure 1.) with an unset area borders (there is no border fences set yet). To support the development of the ecotourism site, they built a jogging track that accessed through the north entrance (subak Sembung) and south entrance (Banjar Tagtag). Those jogging tracks planned as one route, but because of the limitation of funds, the area between the

north and the south of the jogging tracks still could not accessed. There were some facilities provided in Subak Sembung area: parking area, temple, bale subak, and some food seller also allowed around the area. Some farmers also built houser inside the farm area. Pekaseh or the leader of the subak permitted the access to build these houses if the farmer did not have a settlement to stay. The permission would not be given for the people outside of Subak Sembung who want to build their houses in the farm area. This rule written on the traditional rule of Subak Sembung (known as *awig-awig* in the local community) that stated the function of the land in Subak Sembung was for cultivation not for building residences.

The vegetation in Subak Sembung Area is dominated by rice paddy (Oryza sativa) that is planted twice in a year and interspersed by cultivating cucumber (Cucumis sativus). The farmer also planted vegetables commodity as their additional income. The land that used for cultivating vegetable commodities dominantly located on the west side of the farm because: (1) the location near the owner and (2) the road access (jogging track) for more manageable transportation. The farmer groups (Gapoktan in Bahasa Indonesia) work together with the modern markets to motivate and encourage the farmer to plant their commodity consistently. Some farmers that had land around the jogging track also possible to sell their vegetable



Source: Processed Data (Google Earth, 2020)

Figure 1
Map of Subak Sembung Ecotourism Site

commodity to tourists or visitors that walking around their land. Because of the consistent cultivating pattern, the vegetable stock was always well-stocked. The most common vegetable commodity planted were eggplant, kale, spinach, mustard, pepper, merunggai, and gonda. They also cultivated some fruits commodities such as banana, papaya, and orange. The south side of the rice paddy field was relatively steep. These caused faster water flow that finally made the land for cultivating vegetables did not adequately irrigated and the most farmer did not cultivate vegetable commodities in their land. The water pump machine is used more when the farm is ready to be plowed due to mud in the field that facilitates the plowing process.

CONCLUSION

The farmers' socio-economic activities in Subak Sembung were very feasible to attract visitors. In addition to attract visitors, the socio-economic activities that performed by the farmers can also provide education related to farming activities that were being performed by farmers. The policy implication that can be done by the government of Denpasar City and the Bali Provincial was to increase the number of community-based ecotourism areas such as those in the Subak Sembung. Increasing the ecotourism area was one of the efforts to maintain the sustainability of Subak through the tourism sector, which not only provide natural tourism resources, but also contributed to environmental conservation. In order for Subak Sembung ecotourism to run in a sustainable manner, the government of Denpasar City through related institutions was expected to be able to incorporate the agricultural curriculum into early childhood education and primary school, so that children can learn agriculture and visit Subak Sembung Ecotourism, so they can love agriculture and subak. In order to eliminate the contract marketing system, farmers should form agribusiness cooperatives, so that they can improve their bargaining power. In managing ecotourism operations which have been done in a simple manner, it is expected that the role of the government is to assist managers in terms of digital promotion, so that Subak Sembung can be recognized by the wider community. For further researchers, it is expected to examine how the socio-economic and environmental benefits of Subak Sembung ecotourism exist. Further research is also needed on regulation and policy aspects, as a base orientation for the parties in implementing the synergy of tourism and agricultural development in Denpasar City, because so far the failure of ecotourism development has occurred due to overlapping management, disharmony of policies and legislation; and sectors' egos in each Institution/Agency as the person in charge of ecotourism development.

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